SYMPOSIUM NO. 1: PHONETIC UNIVERSALS IN PHONOLOGICAL SYSTEMS AND THEIR EXPLANATION*

(see vol. II, p. 5-59) Moderator: John J. **Ohala**

Panelists: Thomas V. **Gamkrelidze**, André-Georges **Haudricourt**, Robert K. **Herbert**, Jean-Marie **Hombert**, Björn **Lindblom**, Kenneth N. **Stevens**, and Kenneth L. **Pike**

Chairperson: Bertil **Malmberg**

JOHN J. OHALA's INTRODUCTION

Phonetic universals is such a large subject that the members of this symposium despaired of being able, in the short time allotted, to give adequate consideration to any of the general aspects of the theory or practice of the field or to solve any of its "great problems". It was decided, therefore, that the moderator would make a few brief general comments about some of these larger issues, more or less "for the record", but that most of the time of the symposium be devoted to the discussion of one very specific problem in the area of phonetic universals.

General Problems and Issues in Phonetic and Phonological Universals

(In this report I will use the shorter phrase 'phonological universals' for the longer, somewhat unwieldy expression 'phonetic universals in phonological systems', the official topic for this symposium.)

1. Before beginning this discussion, we should define what we mean by *phonological universals.* As this term has come to be used, it means *systematic patternings of speech sounds cross-linguistically.* This definition does not require that the pattern be manifested in every human Language, merely that it have sufficient incidence in the languages of the world such that its occurrence could not be attributed to chance. It is assumed, though, that all languages, indeed, all human speakers, are potentially subject to whatever "forces" create these patterns, but an overt manifestation of these forces may or may not occur and if it does occur, may take different forms. For example, to consider a case discussed extensively by Professor Gamkrelidze, it is presumably the same universal factors which are responsible for the asymmetrical gap in the voiced velar stop position (/g/) in the segment inventories of Dutch, Czech, and Thai, as are re-sponsible for the disproportionately low incidence of /g/ in the lexicon or in running speech of many languages. Likewise, what ever causes the asymmetrical absence of /p/ in Arabic, Nkom, and Chuave, is also responsible for the limited distribution of /p/ in Japanese, i.e., it only appears intervocalically and as a geminate.

2. The concern with phonological universals in our field has both theoretical and practical consequences. Some 100 years ago our intellectual forefathers, Ellis, Sweet, Passy, Lepsius, Jespersen, and others, provided us, in the phonetic alphabet and the descriptive anatomical and physiological terms accompanying it, the equivalent of the Linnean system of classification in

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biology or Mendeleev's periodic table of the elements in chemistry. Today, I believe it safe to say that we have reached the stage equivalent to that which Bohr's model of the atom represented in physics and chemistry. We have a framework within which to observe, to describe, and to establish natural classes of phonetic and phonological entities and processes in all human languages. We are also able, with obvious limitations, to predict and explain the behavior of speech sounds. Commendably, in many cases, these explanations are based on empirically-supported models of parts of the speech communication process. Although it is obviously the case that as we deepen our understanding of some of the basic physical, physiological, and psychological mechanisms serving speech, we also are better able to explain many phonological universals; it is also true that in many cases *it is our observation of phonological universals which leads to a greater understanding of speech mechanisms.* The literature in phonological universals is even now causing us to critically re-examine some of the most fundamental concepts in phonetic and phonological theory, for example, the notions of 'segment', of 'distinctiveness', etc., and to explore in considerable detail in the laboratory basic acoustic, aerodynamic, and auditory mechanisms in speech.

In the practical realm phonological universals can aid us in the analysis and understanding of the phonologies of individual languages: they tell us what to look for and they help us to choose alternative scenarios for the history of sound changes in the language. I personally believe that phonological universals aid us in such cases of *applied phonology* as speech synthesis, automatic speech recognition, speech pathology, speech therapy, and language teaching. It must be said, however, that present there has been very little penetration of universals in these areas.

3. Phonological universals are found in many different forms, e.g., segment inventories, segmental sequential constraints "phonotactics") , allophonic variation, sound change, morphophonemic variation, dialect variation, patterns of sound substitution by first and second language learners, frequency of occurrence of sounds in the lexicon and in connected speech, conventional and esthetic use of speech sounds in onomatopoeia, poetry, jokes, singing, etc. Can we bring all of these disparate phenomena under one theoretical umbrella, using one of these as the base or primitive from which the others may be derived, or, possibly, deriving them from some separate principle external to all of them?

4. Another general issue concerns the problem of how to obtain a truly representative sample of sound patterns from a variety of languages such that the sample is not biassed by including too many or too few languages having certain genetic, typological, or geographical linkages. The many pitfalls of attempting a quantification of phonological data from large samples has been discussed previously, including such concerns as how one differentiates a language from a dialect, whether one should look at the behavior of phones or phonemes and if phonemes, whose conception of the phoneme, etc? The fact is, most works on phonological universals ignore this issue and seem to rely on the investigator's intuitive "feel" for what constitutes a proper sample. Is there any way to make this process objective? How can we create an unbiassed sample; how large should it be?; what criteria should we apply in admitting a language to the sample? Once we have the supposedly unbiassed sample, what type of statistical analysis should we apply to it in our attempts to prove or disprove universal tendencies?

My own solution to this problem, a solution which has parallels in other scientific disciplines, is

to make sure that any posited universal is supported both *inductively* — that is with lots of examples (and few counterexamples)—and *deductively*—that is, by what we know to be the underlying operating principles of speech production and perception.

5. A related issue is whether or not some of the claims made about phonological universals may be distorted by observer bias i.e., be self-fulfilling prophecies. It has been claimed, for example, that all languages code speech in terms of phonemes. But I know of no universally-accepted algorithm which discovers phonemes. And if there were, do we now have any evidence that phonemes and all the properties attributed to them, have psychological and/or physical reality?

A very clear example of the perils of observer bias surrounds claims about universals of syllable structures. It has been claimed that within a syllable, one should not find a transition from voiced to voiceless to voiced. Upon being presented with an apparent counterexample such as [ity], the claimant would protest that there is a syllable boundary between the [t] and [y]! The potential for similar circularity enters into any claim which contains terms that cannot be objectively defined. And this, unfortunately, is true of a very large number of terms used in phonetics and phonology, including terms such as consonant, vowel, segment, syllable, sonority, strength, lenition, etc.

Would we find a different set of universals if we adopted the parallel, hierarchic system such as Professor Pike advocates? Would we have a different, more interesting set of universals if we included in the description of sounds, as Professor Stevens proposes, the sensory information each sound gives rise to?

A Specific Problem in Phonological Universals

The problem selected for special attention during this symposium is by no means a small one and it is doubtful that it will be solved very quickly, certainly not in the short time allotted us. Nevertheless, it is a problem that intersects with the particular interests of most members of the symposium and is a matter to which many members of the audience can contribute. The problem is stated in a deliberately provocative way in order to stimulate discussion.

The notion of a vowel "space" has been used in phonetics for about 2 centuries but it is only recent evidence which points to this space having acoustic-auditory correlates. The research of Lindblom and his colleagues suggests that the placement of vowels in this space in various languages is dictated by the principle of maximal perceptual difference, i.e., that however many vowels there are in the system, they tend to arrange themselves in the available space in such a way as to maximize their distance from each other. This principle seems to adequately predict the arrangement of systems with approximately 7 or 8 vowels. It would most satisfying if we could apply the same principles to predict the arrangement of consonants, i.e., posit an acoustic-auditory space and show how the consonants position themselves so as to maximize the inter-consonantal distance. Were we to attempt this, we should undoubtedly reach the patently false prediction that a 7 consonant system should include something like the following set:

ɗ k’ ts ɬ m r ǂ[1]

Languages which do have few consonants, such as the Polynesian languages, do not have such an exotic consonant inventory. In fact, the languages which do possess the above set (or close to

[1] New IPA symbol: [ǂ].

it), such as Zulu, also have a great many other consonants of each type, i.e., ejectives, clicks, affricates, etc. Rather than maximum differentiation of the entities in the consonant space, we seem to find something approximating the principle which would be characterized as "maximum utilization of the available distinctive features". This has the result that many of the consonants are, in fact, perceptually quite close — differing by a minimum, not a maximum number of distinctive features.

Does this mean that consonant inventories are structured according to different principles from those which apply to vowel inventories? Could it mean that the "spaces" both consonants and vowels range in, are limited by the auditory features (= parameters) recognized by the particular language? Or does it mean that we are asking our questions about segment inventories in the wrong way?